Evaluation of Laboratory Methods to Quantify Chlorophyll-a

A TCEQ Project Contracted to the Texas Institute for Applied Environmental Research (TIAER)

Red River Authority Steering Committee Meeting, April 2019

Background

- The SWQM Program is responsible for monitoring and assessing water quality in Texas. These water quality data provide a basis for the evaluation of the attainment of established uses to support the development of the 303(d) List.
- Chlorophyll-*a* data submitted to SWQMIS is currently analyzed using several different methods.
- TIAER will evaluate the spectrophotometric, conventional fluorometric, and modified fluorometric methods used to quantify chlorophyll-*a*.
- Analyses are conducted on four different chlorophyll concentration levels using lab prepared standards, as well as ambient surface water samples.
- TIAER plus additional labs, including Red River Authority, are participating in this study.

Study Design

- Ambient Samples
  - 2 rounds
- Lab Samples
  - 1 round
- 3 Methods
- 4 Concentrations
- 8 Replicates Each
- 4 Sets of Labs
- Over 1,000 samples total for Phase I

Chlorophyll Concentration Range	Low	Mid-Low	Mid-High	High
Analytical Method	Lab Prepared Sample	Lab Prepared Sample	Lab Prepared Sample	Lab Prepared Sample
	SPEC C-FL M-FL	SPEC C-FL M-FL	SPEC C-FL M-FL	SPEC C-FL M-FL
Replicates	1 1 1	1 1 1	1 1 1	1 1 1
	2 2 2	2 2 2	2 2 2	2 2 2
	3 3 3	3 3 3	3 3 3	3 3 3
	4 4 4	4 4 4	4 4 4	4 4 4
	5 5 5	5 5 5	5 5 5	5 5 5
	6 6 6	6 6 6	6 6 6	6 6 6
	7 7 7	7 7 7	7 7 7	7 7 7
	8 8 8	8 8 8	8 8 8	8 8 8
	24 Total	24 Total	24 Total	24 Total

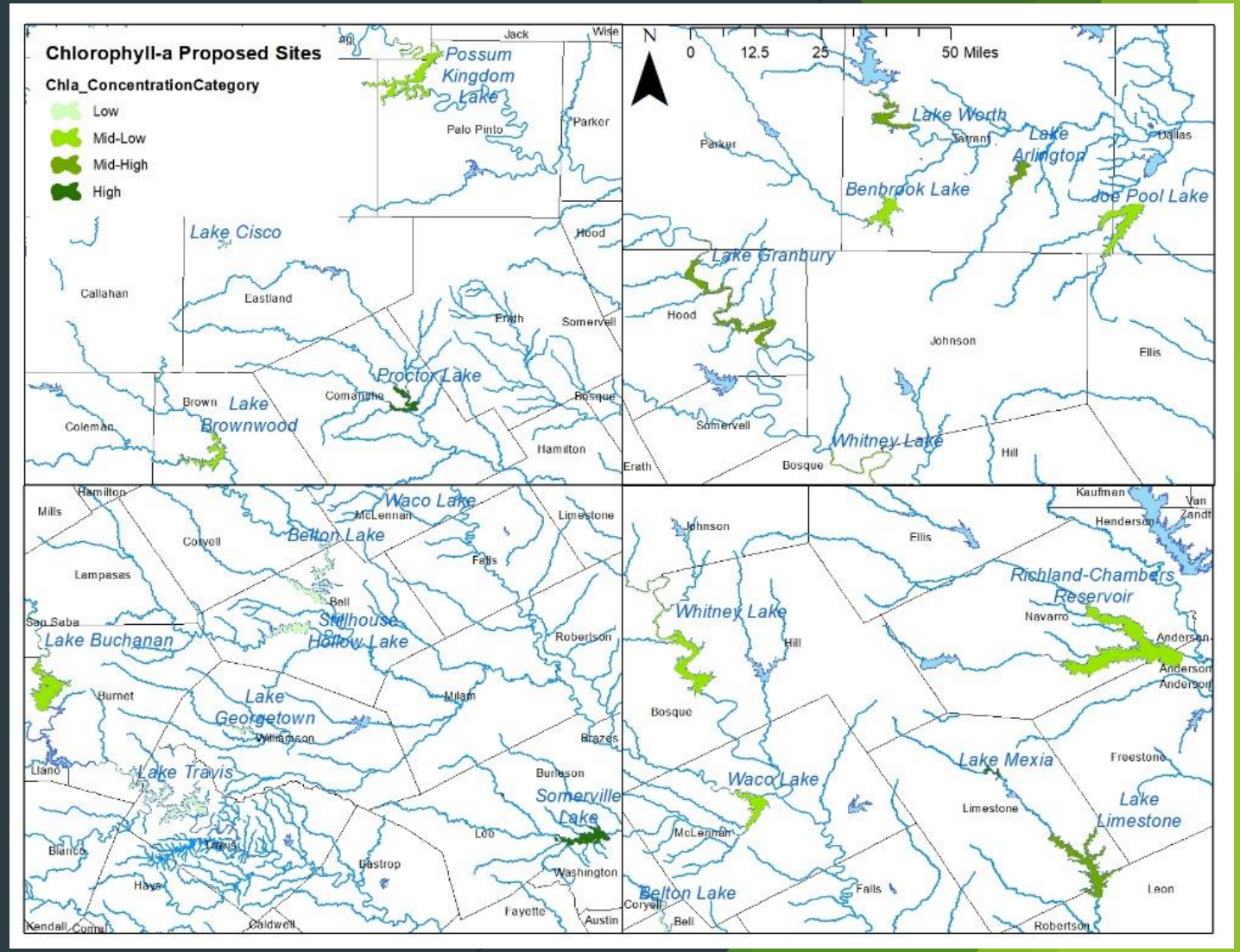
Chlorophyll Concentration Range	Low	Mid-Low	Mid-High	High
Analytical Method	Ambient Water Sample	Ambient Water Sample	Ambient Water Sample	Ambient Water Sample
	SPEC C-FL M-FL	SPEC C-FL M-FL	SPEC C-FL M-FL	SPEC C-FL M-FL
Replicates	1 1 1	1 1 1	1 1 1	1 1 1
	2 2 2	2 2 2	2 2 2	2 2 2
	3 3 3	3 3 3	3 3 3	3 3 3
	4 4 4	4 4 4	4 4 4	4 4 4
	5 5 5	5 5 5	5 5 5	5 5 5
	6 6 6	6 6 6	6 6 6	6 6 6
	7 7 7	7 7 7	7 7 7	7 7 7
	8 8 8	8 8 8	8 8 8	8 8 8
	24 Total	24 Total	24 Total	24 Total

Chlorophyll Concentration Range	Low	Mid-Low	Mid-High	High
Analytical Method	Ambient Water Sample	Ambient Water Sample	Ambient Water Sample	Ambient Water Sample
	SPEC C-FL M-FL	SPEC C-FL M-FL	SPEC C-FL M-FL	SPEC C-FL M-FL
Replicates	1 1 1	1 1 1	1 1 1	1 1 1
	2 2 2	2 2 2	2 2 2	2 2 2
	3 3 3	3 3 3	3 3 3	3 3 3
	4 4 4	4 4 4	4 4 4	4 4 4
	5 5 5	5 5 5	5 5 5	5 5 5
	6 6 6	6 6 6	6 6 6	6 6 6
	7 7 7	7 7 7	7 7 7	7 7 7
	8 8 8	8 8 8	8 8 8	8 8 8
	24 Total	24 Total	24 Total	24 Total

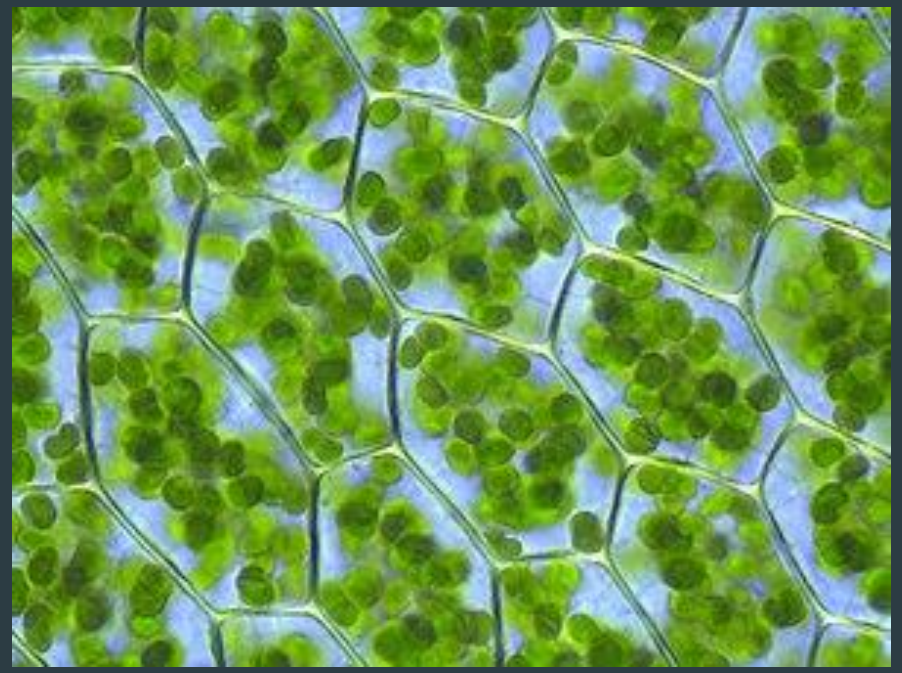
	Total # Lab Prepared Samples	Total # Ambient Water Samples	Total # Samples
Contract Lab	96	192	288
Sub-contract Lab 1	96	192	288
Sub-contract Lab 2	96	192	288
Sub-contract Lab 3	96	192	288
		1152 Total	

Possible Sampling Locations

- First round of ambient samples were collected from the following waterbodies
  - New Marlin City Lake
  - Proctor Lake
  - Lake Cisco
  - Possum Kingdom Lake
  - Lake Coleman



Current Status



- TIAER has received all of the results for the lab prepared standards and results for the first round of ambient samples.
- The second round of ambient sampling will take place each week of April 2019.
- Data will be analyzed throughout the spring and a report will be produced by the end of Aug 2019.

Future Directions: Phase II

Phase II will take place FY20-21 and tentatively includes:

- TIAER Intralab analysis of ambient water at four concentrations
- TIAER Intralab analysis of ambient water with monthly sampling
- Interlab (up to 9 labs) analysis of ambient water at four concentrations
- Interlab (up to 9 labs) analysis of ambient water with quarterly sampling
- Analyze relationships between multiprobe in-situ readings and lab results
- Investigate modifications to standard operating procedures for each of the chlorophyll-a methods
- Data analyzed and report produced by August 2021

For additional information:

Larry Hauck

Hauck@tarleton.edu

Texas Institute for Applied Environmental Research at Tarleton State University